TITLE OF THE INVENTION

VIDEO-ON-DEMAND (VOD) MANAGEMENT SYSTEM AND METHODS

CROSS-REFERENCE TO RELATED APPLICATIONS

5   [0001]   This application claims benefit of provisional Application No. 60/429,966, filed November 27, 2002, the disclosure of which is fully and expressly incorporated herein by reference.

10 ## FIELD OF THE INVENTION

[0002]   The present invention relates to multimedia content distribution systems and methods, and specifically to multimedia content distribution systems and methods that manage the preparation, scheduling, and propagation processes for

15   video-on-demand ("VOD") assets.

BACKGROUND

[0003]   With the development of broadband technologies, cable and satellite television services are increasingly

20   providing their customers with VOD services. In a typical VOD system, the cable or satellite multiple service/systems operator ("MSO") receives audiovisual content such as features, which may be movies, television shows, or other types of feature content, and the feature's associated previews and

graphics files (a feature and its associated previews and graphics files may be collectively referred to herein as "content") from content providers, stores the content locally, and then transmits the content to a viewer upon the viewer's

5   request. Content providers generally transmit content to MSOs via satellite transmissions or via a high-speed terrestrial-based network using appliances commonly referred to as pitchers. To receive the transmissions from the content providers, MSOs deploy a number of appliances commonly referred

10   to as catchers. Catchers receive the transmissions from the content providers and, after receiving a complete file, relays the file to a VOD server. The VOD server then provides content to consumers of the MSO upon demand by the consumers.

[0004]   Because a particular MSO will receive

15   transmissions from a number of different content providers, each of whom may use different formats when transmitting their own content, problems may arise when the MSO attempts to process content prior to providing the content to its consumers. For example, file processing problems may arise due

20   to extensible markup language ("XML") formatting issues, such as, e.g., a content provider may place metadata associated with the content in its files that the MSO's system regards as non-compliant data. As a result, metadata provided by various

content providers may be inconsistent, unmanageable, or

interpreted incorrectly when received by the MSO. Further,

content providers and MSOs may use different and/or proprietary

file transfer systems that may contribute to incompatibilities

5   and transmission problems. Problems may also arise if a file

contains corrupted data. As a result of the metadata issues as

well as the file corruption issues, content may not be

available on the VOD servers when scheduled.

[0005]   Receiving data streams from many content

10   providers has also limited the data available to a MSO that may

be used to monitor the flow of VOD assets through its system.

As a result, MSOs currently spend an inordinate amount of human

resources to manually monitor and intervene with content

management. The problem of a lack of visibility of the flow of

15   VOD assets is also exacerbated by current content distribution

schemes in which a content provider may independently operate

the content input portion of the distribution process, third

party aggregators, distributors, and other enablers operate the

encoding and metadata management portion, the content upload

20   portion, and the download to catchers portion of the

distribution process, and the MSOs operate the content

distribution to end users portion of the process. That is,

currently, a content provider may be responsible for providing

content and metadata, an aggregator, distributor, or other third party enabler may be responsible for combining the content and metadata, uploading the content to satellites, and then downloading the content to catcher appliances, and a MSO

5 may be responsible for delivering content to its end users or consumers (references herein to "end users" are intended to refer to either an end user or a consumer). Because of the current lack of visibility of the flow of VOD assets, content management problems are difficult to isolate and resolve by the

10 MSO, the content providers, or any other party in the content distribution chain.

[0006] Consequently, there is a need for systems and methods that allow a MSO and content providers to resolve transmission problems with regard to VOD content transmissions

15 and to provide metadata that will comply with MSO requirements.

[0007] There is also a need for systems and methods that offer greater visibility and control over the transmission of VOD content, thereby allowing proactive monitoring of the assets being transmitted within the system.

20 [0008] There is also a need for systems and methods that offer greater visibility over the usage information of the content and that allow for proactive programming decisions based on the performance or usage of such content.

SUMMARY OF THE INVENTION

[0009]   The present invention is directed to methods and systems for managing and delivering metadata while providing visibility and control over such metadata and the transmission of the content associated with such metadata as well as the usage information associated with such content.

[0010]   In one aspect of the present invention a method of distributing content in the form of multimedia asset data files using a VOD management system is provided. A content provider and a MSO input the metadata associated with a multimedia asset data file into the VOD management system (unless otherwise noted, references herein to "metadata" refer to information of the associated multimedia asset data files as defined herein, such as, e.g., title, date of theatrical release, summary of plot, cast, and crew, Motion Picture Association of America ("MPAA") rating, length, price per view, scheduling information, other XML data desired by a MSO, and the like, which may be obtained from data entry over a web application, CableLabs XML, or ingestion of legacy media asset management databases). The VOD management system manages such metadata. The MSO (and the content provider, to the extent permitted by the MSO) may access the metadata by accessing the VOD management system. The content provider then delivers the

multimedia asset data file to a MSO via satellite or other

distribution system, such as tape delivery, disk delivery, a

local network, or a terrestrial-based network. The MSO (and

the content provider, to the extent permitted by the MSO) may

5   monitor such delivery using the VOD management system. After

the file is delivered to the MSO, the VOD management system

delivers a schedule to a VOD server instructing the VOD server

to request the metadata from the VOD management system and

requesting the multimedia asset data file from the catcher to

10   which it has been delivered. Then, the file is uploaded to the

VOD server maintained by the MSO. The MSO (and the content

provider, to the extent permitted by the MSO) may monitor such

delivery using the VOD management system. The VOD management

system generates usage reports relating to the usage of the

15   multimedia asset data files by the end users of the MSOs for

use by the MSOs (and the content provider, to the extent

permitted by the MSO) to manage the delivery of multimedia

asset data files.

[0011]   In another aspect of the present invention, a

20   method of using a VOD management system to distribute

multimedia asset data files from a plurality of content

providers to a plurality of MSOs is provided. A plurality of

content providers and a plurality of MSOs input metadata

associated with a plurality of multimedia asset data files into

the VOD management system. The VOD management system manages

such metadata. The MSOs (and the content providers, to the

extent permitted by each MSO) may access the metadata by

5   accessing the VOD management system. A plurality of content

providers then deliver a plurality of multimedia asset data

files to a plurality of MSOs via satellite or other

distribution system, such as tape delivery, disk delivery, a

local network, or a terrestrial-based network. The MSOs (and

10   the content providers, to the extent permitted by each MSO) may

monitor such delivery using the VOD management system. After

the plurality of files are delivered to the MSOs, the VOD

management system delivers schedules to VOD servers instructing

the VOD servers to request the metadata from the VOD management

15   system and requesting the multimedia asset data files from the

respective catchers to which the files have been delivered.

Then, the files are uploaded to VOD servers maintained by the

MSOs, preferably using an asset URL assigned to each file. The

MSOs (and the content providers, to the extent permitted by

20   each MSO) may monitor such delivery using the VOD management

system. The VOD management system generates usage reports

relating to the usage of the multimedia asset data files by the

end-users of the MSOs for use by the MSOs (and the content

providers, to the extent permitted by each MSO) to manage the

delivery of multimedia asset data files.

[0012]   These and other objects and features of the

present invention will be appreciated upon consideration of the

5   following drawings and description.

BRIEF DESCRIPTION OF THE FIGURES

[0013]   Figure 1 is a schematic diagram of the

components of a VOD management system of the present invention.

10   [0014]   Figure 2 illustrates a price calculation process

using pricing rules as implemented by the systems and methods

of the present invention.

[0015]   Figure 3 is a schematic diagram of an asset

distribution functional component of a VOD management system of

15   the present invention.

[0016]   Figure 4 illustrates a workflow implemented by

an asset distribution functional component of a VOD management

system of the present invention.

[0017]   Figure 5 illustrates a workflow implemented by a

20   content upload functional component of a VOD management system

of the present invention.

[0018]   Figure 6 is another illustration of physical components used to implement a VOD management system of the present invention.

[0019]   Figure 7 illustrates the implementation layers

5   of one embodiment of a VOD management system of the present invention.

DETAILED DESCRIPTION

[0020]   The present invention provides for closed loop

10   VOD management systems and methods to ensure accurate and timely availability of VOD content from multiple content providers using multiple distribution systems.

[0021]   In one implementation of a method of the present invention, four main functional components, a metadata

15   ingestion component, a file distribution tracking component, a file upload tracking component, and a usage reporting component, enable a VOD management system to manage and distribute metadata and to track multimedia asset data files. All of the multimedia asset data files are tracked by a VOD

20   management system 110, and may be assigned a unique workflow identification number to allow the VOD management system 110 to track the location and status of the file at any time. Communication between the functional components and the VOD

management system 110 may be accomplished via simple request response messaging application program interfaces ("APIs"), or data exchanges using known XML formats.

[0022]   Using the methods of the present invention, metadata 106 and multimedia asset data files 108 from content providers and MSOs are ingested and validated. Turning to Figure 1, the components required to implement the metadata ingestion functional component of a method of the present invention are illustrated. A VOD management system 110 is configured to accept data and instructions from content providers or content networks 102 (unless otherwise noted, references herein to "content provider" are intended to refer to either a content provider or a content network/content aggregator) and MSOs 112. Specifically, the VOD management system 110 receives metadata 106 of various formats, and tracks multimedia asset data files 108 with which the metadata 106 is associated. A multimedia asset data file 108 may include content (such as, *e.g.*, a feature file, a preview file, a graphics file, and the like; these may be referred to herein as "elements"), basic metadata associated with each element that provides information on the elements that helps confirm accuracy of delivery. The feature may be in any suitable format, such as, *e.g.*, a MPEG file. Multimedia asset data

files 108 for movies, for example, may include graphics files

of movie poster art or box covers. These graphics files may be

any suitable format, such as, *e.g.*, JPEG, TIFF, GIF, and the

like.

5   [0023]   In a preferred embodiment, a web-based user

interface 104 is provided for each content provider 102 to

communicate with the VOD management system 110. The content

provider 102 may transmit metadata to the VOD management system

110 using a variety of formats, including, but not limited to,

10   CableLabs XML, MOD, tab delineated files, and the like. Using

the interface 104, the content provider 102 preferably tracks

the transmission of multimedia asset data files 108 and

transmits related metadata 106 using a suitable internet

protocol, such as, *e.g.*, HyperText Transfer Protocol ("HTTP")

15   or File Transfer Protocol ("FTP"). For example, the content

provider 102 may use the interface 104 to provide the VOD

management system 110 with the name of the multimedia asset

data file 108, a description of the file 108, the MSOs 112

scheduled to receive the file 108, a target ship date for

20   delivery of the file 108 to the specified MSOs 112, an actual

ship date for delivery of the file 108 to the MSOs 112, and a

delivery method for the file 108. The content provider 102 may

also specify that different multimedia asset data files 108

form a single delivery group that contains several different features. The delivery group may, for example, contain several different movies and, accordingly, the multimedia asset data files 108 that are associated with those movies. As one

5   example, the content provider 102 may create a delivery group entitled "July New Releases" and place within that delivery group the multimedia asset data files 108 associated with the new release movies scheduled to be released on that July. References herein to the transmission and delivery of

10   multimedia asset data files 108 individually will also be understood to refer to the transmission and delivery of multimedia asset data files 108 in delivery groups.

[0024]   Using the interface 104, the content provider 102 also specifies the calendar dates during which a particular

15   multimedia asset data file 108 will be made available for delivery to MSOs 112 (and, therefore, for purchase by end users of the MSOs 112). The content provider 102 may also assign a delivery priority to each multimedia asset data file 108 (or delivery group of multimedia asset data files 108) in order to

20   allow the VOD management system 110 to allocate bandwidth to various multimedia asset data files 108. The allocation of bandwidth is particularly important when multimedia asset data files 108 are being transmitted via satellite delivery. To

facilitate the reception of multimedia asset data files 108

from content providers 102, the VOD management system 110 is

configured to integrate with legacy/existing asset management

systems, such as, *e.g.*, digital asset management systems

5   available from WebWare Corporation (Sausalito, California).

During the data entry process, information is validated for

correctness and completeness.

[0025]   As part of the title assembly workflow,

multimedia asset data files 108 are registered with the VOD

10   management system 110. Each content provider 102 is assigned a

provider ID, and transmissions from the content provider 102 to

the VOD management system 110 include the provider ID. Based

upon the provider ID and a provider asset ID (*i.e.*, an asset

identifier provided by the content provider 102), the VOD

15   management system 110 assigns a globally unique identifier to

the corresponding multimedia asset data file 108 to identify

the file 108 throughout the content delivery process.

[0026]   As with the content providers 102, MSOs 112

preferably communicate with the VOD management system 110 using

20   a web-based user interface 114. The VOD management system 110

coordinates the metadata 106 and multimedia asset data file 108

ingestion and validation process using a workflow customizable

by the MSO 112. In general, the workflow requires that the

metadata 106 and multimedia asset data file 108 comply with

values and business rules provided by the MSO 112 before the

VOD management system 110 will determine that the metadata 106

and multimedia asset data file 108 was properly received.

5   [0027]   In one embodiment, the interface 114 enables a

MSO 112 to enter, edit, and manage business rules using a text

editor. In another embodiment, the interface 114 enables a MSO

112 to enter, edit, and manage business rules using a graphic

user interface 114. Using the interface 114, a MSO 112

10   provides scheduling and business rules to the VOD management

system 110, including, but not limited to, ratings filters,

pricing rules, category rules, platform conversion rules,

electronic program guide ("EPG") data, storage allocations for

VOD servers, scheduling approval guidelines, and the like. The

15   business rules are preferably contained within their own

grouping elements, such as, *e.g.*, ratings filters are grouped

together and pricing rules are grouped together. The VOD

management system 110 preferably stores business rules as XML

documents, and identifies business rules with particular MSOs

20   112. Alternatively, the VOD management system 110 may store

business rules in a database rather than as XML files. When

the VOD management system 110 receives metadata 106 and

multimedia asset data files 108 from a content provider 102,

the VOD management system 110 validates the metadata 106 and

files 108 using the business rules provided by the MSO 112.

Descriptions of several exemplary business rules follow.

[0028]   Ratings filters are rules used to block the

5   delivery of files 108 based upon a rating, such as, *e.g.*, a

MPAA rating. A rating filter should consist of a rating and an

associated action, such as "blocked" to specify that features

with this rating should not be delivered or "unblocked" to

specify that features with this rating may be delivered. For

10   example, a particular deployment may use a ratings filter in

order to prevent the delivery of adult content. The default

behavior associated with a rating is "unblocked." That is, if

a rating filter does not exist for a particular rating, the VOD

management system 110 will consider features with that rating

15   as "unblocked."

[0029]   Pricing rules allow a MSO 112 to determine

and/or override a default price associated with a file 108.

When used, pricing rules may allow a file 108 to receive a

different price at each MSO deployment. Figure 2 illustrates a

20   price calculation process using pricing rules as implemented by

the systems and methods of the present invention. During the

creation of a multimedia asset data file 108, the content

provider 102 assigns a default pricing model to the file 108.

The pricing model will tag the file 108 for purposes of pricing

and assign the file 108 a default price. The pricing model may

be specific to a particular MSO 112, and may also include a

name for the pricing model (*e.g.*, "Kids," "New Release,"

5   "Library," "Adult," "Top Picks," "Custom," and the like), a

string description of the pricing model, a default price

associated with the pricing model, and a client ID or other

identification to associate the pricing model with a particular

MSO 112. In one embodiment, the assignment of the pricing

10   model will be independent of the feature associated with the

file's 108 genre and/or categorization. If needed, a MSO 112

or a content provider 102 will be able to assign a customized

pricing model to the multimedia asset data file 108.

Additionally, the VOD management system 110 can associate a

15   pricing override with a pricing model. A pricing override will

consist of a pricing model name and an associated price. A

feature's price is first set using the default price associated

with its assigned pricing model (step 202). The VOD management

system 110 next analyzes the multimedia asset data file 108 to

20   determine whether a custom pricing model has been assigned to

the file 108 (step 204). In the case where the file 108 has

been assigned to a custom pricing model, the feature's

specially assigned price is used instead of the default price

(step 206). If the file 108 has not been assigned a custom

pricing model, the VOD management system 110 determines whether

a pricing rule, such as a pricing override rule, has been

assigned to the file 108 (step 208). If so, the VOD management

system 110 assigns an override price to the file 108 (step

5   210). Upon completion of the aforementioned steps, the VOD

management system 110 determines a final price for the file 108

(step 212).

[0030] Category rules allow a deployment's metadata

file to receive only those categories that are locally defined.

10   When used, category rules allow a file 108 to be categorized

differently across a MSO 112 network.

[0031] Platform specialization or conversion rules

allow the VOD management system 110 to structure an electronic

program guide ("EPG") to a custom format that may be designated

15   by each MSO 112 or MSO location (deployment). In one

embodiment, a minimum of three sets of platform conversion

rules are used to provide for three different displays

available for a MSO's 112 EPG. The platform conversion rules

are used by the VOD management system 110 to convert the

20   presentation format of metadata associated with a feature into

a display format that is specific to the needs of a particular

MSO 112. The VOD management system 110 also utilizes the

platform conversion rules to generate an appropriate platform

compliant XML for a MSO 112, and may also use the conversion

rules to handle image conversion for a particular MSO 112.   In

one embodiment, the platform conversion rules are hard coded.

In another embodiment, the platform conversion rules utilize a

5   script design that facilitates changes to any particular set of

conversion rules.

[0032]   The custom EPG function of the VOD management

system 110 is also usable to generate targeted promotions.   For

example, the EPG for a MSO 112 may be customized with

10   multimedia promotional elements including detailed information

about available VOD features and reviews of the available VOD

features.

[0033]   In another embodiment, the VOD management system

110 is capable of customizing the EPG to allow functionality

15   similar to an interface provided by a DVD feature.   The DVD-

like functionality that the VOD management system 110 adds to

the EPG includes allowing an end user to choose alternate

endings of a feature or different commentary tracks for a

feature.   Accordingly, the VOD management system 110 is capable

20   of processing and distributing multimedia asset data files 108

that incorporate multiple language tracks, multiple video

assets (e.g., alternate endings, deleted scenes, and the like),

multiple graphics, and an extensible metadata scheme to include

any additional text that may be desired for a given multimedia

asset data file 108 to provide DVD-like features. When

delivering these multimedia asset data files 108, the VOD

management system 110 is capable of customizing a particular

5   EPG to enable an end user to enable the DVD-like features

included with the file 108.

[0034]   The VOD management system 110 enables users to

view and analyze metadata and scheduling information. For

example, when multimedia asset data files 108 are scheduled to

10   be delivered in delivery groups, the user interface 104 enables

the content provider 102 to locate an existing/scheduled

delivery group by searching for one of the following

parameters: the name of a specific delivery group; delivery

groups that contain a specific multimedia asset data file 108,

15   e.g., delivery groups that contain a specific movie or other

feature; delivery groups that are scheduled for a specific MSO

112; the status of delivery groups, e.g., in progress,

approved, completed, and the like; or the scheduled target

delivery date. The level of information available to any

20   particular user will vary depending on that user's clearance

level.

[0035]   In another embodiment, the VOD management system

110 incorporates an advertising server that is capable of

implementing dynamic advertising play lists that are targeted

to individual end users. The advertising server is preferably

in operable connection with the VOD server 125 of a MSO 112.

The VOD management system 110 is configured to analyze the

5   usage data provided by the VOD server 125 and generate usage

reports in order to deliver information necessary for the

advertising server to personalize advertising to an end user.

For example, the VOD management system 110 analyzes the usage

reports to build business rules that are used to deliver data

10   used and analyzed by the advertising server to insert ads into

content delivered to an end user. The advertising delivered to

a particular end user is preferably determined based upon the

end user's viewing habits and characteristics. For example,

the VOD management system 110 may generate an advertising play

15   list that includes advertising relating to sports or action

movies that may be inserted into content to be delivered to an

end user whose viewing characteristics include a number of

action movies. The play list is then delivered to the

advertising server, and the advertising server analyzes

20   advertising inventory to create a suitable matching ad that is,

in turn, inserted into a feature ordered by the end user and

delivered by the VOD server 125. In another embodiment, the

advertising play list generated by the VOD management system

110 includes advertising that is manually inserted by either

the MSO 112 or a content provider 102 to provide an on-demand

advertising function that enables the specific targeting of

advertising to certain end users.

[0036]   In another embodiment, the VOD management system

5   110 enables campaign management functionality designed to make

possible for a content provider 102 or MSO 112 to control the

marketing and branding of its content. Features provided by

the campaign management functionality include enabling a

content provider 102 or MSO 112 to bundle selected groups of

10   multimedia asset data files 108, set pricing for multimedia

asset data files 108, determine promotions for multimedia asset

data files 108, and provide closed-loop reporting. For

example, a content provider 102 or MSO 112 may analyze a usage

report provided by the VOD management system 110 to select

15   certain multimedia data asset files 108 based upon, *e.g.*, end

user viewing habits, and then use the campaign management

functionality to bundle selected multimedia asset data files

108, set pricing for selected files 108, and set promotions for

selected files 108. An additional feature that may be provided

20   by the campaign management functionality is to increase a

content provider's 102 (and MSO's 112) visibility into the

content preparation and distribution process while abstracting

away details such as formats, bit rates, and regional business

rules. Also, the campaign management functionality may be configured to allow a content provider 102 to implement advertising supported VOD. In another embodiment, the VOD management system 110 is configured to integrate with third

5   party campaign management tools.

[0037]   Using the methods of the present invention, the multimedia asset data files 108 are distributed to MSOs 112. Turning to Figure 3, the components of a system required to implement the asset distribution functional component are

10   illustrated. A multimedia asset distribution system or network("ADS") 120 facilitates the delivery of multimedia asset data files 108 from content providers 102 to the MSO 112. Each content provider 102 uses a pitcher appliance 122 to transmit multimedia asset data files 108 to the MSO 112. The multimedia

15   asset data files 108 may be scheduled for individual transmission to the MSO 112, or a group of multimedia asset data files 108 may be scheduled for transmission as part of a delivery group to the MSO 112. Although only one pitcher 122 is illustrated, it will be appreciated that each content

20   provider 102 may implement a plurality of pitchers 122.

[0038]   The pitcher 122 is a hardware and software component that is responsible for initiating and coordinating the transfer of a multimedia asset data file 108 to the MSO

112.   The pitcher 122 may be implemented using any suitable

server, such as, *e.g.*, servers available form Compaq/Hewlett-

Packard (Palo Alto, California).   In one embodiment, the

pitcher 122 will deconstruct a multimedia asset data file 108

5   into smaller elements in order to expedite the transfer of the

multimedia asset data file 108 to the MSO 112.   In a preferred

embodiment, the pitcher 122 also augments the multimedia asset

data file 108, and elements (*e.g.*, feature, preview, and

graphics files for multimedia asset data files 108 relating to

10   the feature) thereof, with metadata 106.   The pitcher 122

transmits the elements of the multimedia asset data file 108,

along with associated metadata 106, to a catcher appliance 124

using any suitable satellite distribution channel 126.   The

satellite distribution channel 126 may include, for example, an

15   Internet Protocol ("IP") encapsulator that is coupled to both

the pitcher 122 and a satellite uplink facility.   Here, the IP

encapsulator is configured to relay transmissions from the

pitcher 122 to the satellite uplink facility.   The satellite

uplink facility then transmits the data elements of the

20   multimedia asset data file 108 to various orbiting satellites,

which in turn transmit the elements to a satellite downlink

facility of the MSO 112.

[0039]   The MSO 112 implements catcher appliances 124 coupled to its satellite downlink facility and configured to receive transmissions originating from content providers 102. To process multiple data transmissions from multiple content

5   providers 102, the MSO 112 may utilize a farm containing a plurality of catchers 124, or use multiport catchers 124 configured to simultaneous receive a plurality of transmissions from multiple content providers 102. An example multiport catcher suitable for use with the present invention is

10   disclosed in co-pending and commonly assigned application entitled "Multicast Distribution System" filed on October 22, 2003, U.S. Application Serial Number 10/692,082, which is incorporated herein by reference.

[0040]   Each catcher 124 is a hardware and software

15   component that may be based on servers such as those available from Compaq/Hewlett-Packard (Palo Alto, California), Dell Computer (Round Rock, Texas), and IBM (Armonk, New York). In a preferred embodiment, the catcher 124 will include a minimum of 256 MB of random access memory ("RAM"), a plurality of

20   peripheral component interconnect ("PCI") expansion slots to support the integration of a data receiver card (with a multiport catcher 124 having as many PCI slots as the desired number of data receiver cards within the catcher 124), and at

least one data receiver card capable of receiving satellite transmissions. Multiport catchers 124 will implement a plurality of data receiver cards. In one embodiment, universal serial bus ("USB") ports are provided on the catcher 124 and

5 allow for the addition of functionality via external peripherals. Additionally, the catcher 124 includes at least 120 GB of storage capacity. For robustness and reliability, the storage may be allocated across a redundant array of inexpensive disks ("RAID") array, and to minimize cost IDE

10 storage technology may be utilized. Furthermore, the catcher 124 may incorporate a form of out-of-band management that would allow for dial-up access, cold start-up, or manual rebooting of the catcher 124 if necessary.

[0041] In addition to satellite transmissions, the

15 catcher 124 is preferably also able to receive multimedia asset data files 108 locally using physical media (*i.e.*, tapes or disks), a local network, or a terrestrial-based network. Accordingly, the catcher 124 may incorporate a digital versatile disc ("DVD") based drive or other suitable local data

20 drive. Similarly, the catcher 124 may be coupled to a FTP server to obtain multimedia assets from the FTP server. The catcher 124 may further include a removable disk drive to allow for local exchange of data via removable disks.

[0042] The catcher 124 is configured to confirm successful receipt of transmissions originating from a pitcher 122. Accordingly, the catcher 124 is operably coupled to the VOD management system 110 via a network connection 128. The network connection 128 may be any suitable communications network, such as, *e.g.*, an internet-based network, a public switched telephone network ("PSTN"), a corporate virtual private network ("VPN") and the like. To connect to the network connection 128, the catcher 124 preferably incorporates a network interface ("NIC") card that enables the catcher 124 to utilize 10/100 ethernet, or a similar high speed network connection. Alternatively, the catcher 124 may use a standard modem to connect to the network connection 128. Using the network connection 128, the catcher 124 acknowledges to the VOD management system 110 a successful or failed transmission, and in the event of a failed transmission, requests a complete or partial retransmission of the multimedia asset data file that was not properly received. In a similar fashion, a network connection 127 between each pitcher 122 and the VOD management system 110 is provided. The pitcher 122 utilizes the network connection 127 to inform the VOD management system 110 when a transmission is initiated by the pitcher 122.

[0043]   Copending and commonly assigned application

entitled "Multicast Distribution System" filed on October 22,

2003, U.S. Application Serial Number 10/692,082, which is

incorporated herein by reference, discloses additional details

5   of an asset distribution system suitable for use with the

systems and methods of the present invention, and has been

expressly incorporated by reference.

[0044]   Figure 4 illustrates an example workflow that is

implemented by the asset distribution functional component of

10   the present invention. As noted herein, the pitcher 122 of a

content provider 102 transmits a multimedia asset data file 108

to the catcher 124 in elements. Figure 4 shows the

distribution of a multimedia asset data file 108 using three

elements, namely a feature element with related basic metadata,

15   a preview element with related basic metadata, and a graphic

element with related basic metadata. The pitcher 122 transmits

the movie/feature element (step 402), and the movie/feature

element is subsequently received by the catcher 124 of the MSO

112 (step 404). The catcher 124 analyzes the movie/feature

20   element and related metadata to determine whether the element

was properly received (step 406). If the movie/feature element

was not properly received, the catcher 124 transmits an alarm

to the VOD management system 110 to inform the VOD management

system 110 that a retransmission of the movie/feature element
is required (step 408). If the movie/feature element was
properly received, the catcher 124 stages the movie/feature
element while awaiting delivery of the other elements of the

5   multimedia asset data file 108 (step 410). Next, the pitcher
122 transmits the preview element (step 412), and the preview
element is subsequently received by the catcher 124 (step 414).
The catcher 124 analyzes the preview element and related
metadata to determine whether the element was properly received

10   (step 416). The catcher 124 transmits an alarm to the VOD
management system 110 if the preview element was not properly
received, thereby informing the VOD management system 110 that
a retransmission of the preview element is necessary (step
418). If the preview element was properly received, the

15   catcher 124 stages the preview element while awaiting delivery
of the other elements of the multimedia asset data file 108
(step 420). Finally, the pitcher 122 transmits the graphic
element (step 422), which is received by the catcher 124 (step
424). The catcher 124 analyzes the graphic element and related

20   metadata to determine whether the element was properly received
(step 426). If the graphic element was not properly received,
the catcher 124 transmits an alarm to the VOD management system
110, informing the VOD management system 110 that a
retransmission of the graphic element is required (step 428).

If properly received, the catcher 124 stages the graphic

element along with the other already received elements of the

multimedia asset data file 108 (step 430). It will be

appreciated that a greater or smaller number of elements may be

5   used, and that the elements may be transmitted in any order.

[0045]   After receiving all of the elements of the

multimedia asset data file 108, the catcher 124 confirms

successful delivery of the multimedia asset data file 108 to

the VOD management system 110 and waits for a request from the

10   VOD server 125 to release the multimedia asset data file 108 to

the VOD server 125. Using the master schedule generated by the

VOD management system 110, the catcher 124 then releases the

file 108 to the VOD server 125 (step 436). The VOD management

system 110 tracks the request and delivery of metadata 106 and

15   the file 108 to the VOD server 125.

[0046]   The methods of the present invention are also

used to coordinate the upload of content from several content

providers, as well as provide visibility into the success or

failure of the upload process. The process of uploading

20   content to a VOD server 125 is driven by the VOD server 125 and

coordinated by the VOD management system 110. Working with the

VOD management system 110 and the catcher or catchers 124, the

VOD server 125 coordinates the upload of the multimedia asset

data files 108 that are received from the content providers 102, and also provides visibility into the success or failure of the upload process. The process of distributing a multimedia asset data file 108 starts with the file 108 being

5   assigned to a distribution schedule. Scheduling involves selecting distribution dates (including a start and an end date), selecting the appropriate set of VOD deployments (*i.e.*, head ends), and assigning marketing information such as, *e.g.*, pricing and categorization. In addition, scheduling may also

10   involve the selection of the multimedia asset data files 108 that should be distributed to end users. Prior to the distribution of a multimedia asset data file 108 to a particular end user, the scheduling information for the file 108 must be approved by the VOD management system 110.

15   [0047]   Turning to Figure 5, an example workflow implemented by the content upload functional component of the system is illustrated. The VOD upload coordination process is initiated by distributing a localized master schedule to each MSO 112. As shown in Figure 5, the VOD server 125 submits a

20   schedule request to the VOD management system 110 of the system (step 502). In this example, the VOD server 125 may initiate a schedule update request to the VOD management system 110 at a regular interval, such as, *e.g.*, daily, hourly, and the like.

In response, the VOD management system 110 provides a customized or localized master schedule for the MSO 112 to the MSO's VOD server 125 (step 504). In one embodiment, a file 108 will be included as part of the master schedule once all of the

5   following steps have been completed: the file 108 has been successfully received by the catcher 124, the content provider 102 and MSO 112 have inserted all associated metadata 106 into the VOD management system 110, the content provider 102 or MSO 112 has provided a date on which the file 108 and metadata 106

10   should be uploaded to the VOD server 125 and that date or the business rules governing that date have been determined to be met by the VOD management system 110, and the MSO 112 has indicated the priority of the file 108 relative to other files. The master schedule is customized for each MSO 112 and reflects

15   the status of the multimedia asset data files 108 that are to be delivered to each MSO 112 or MSO location (deployment). The VOD server 125 then processes the schedule update it receives from the VOD management system 110 by modifying the localized master schedule. For example, the schedule update includes

20   instructions for inserting and deleting files 108 from the master schedule and performing other updates to the master schedule. Similarly, the VOD server 125 may initiate and process metadata updates to change the title, pricing, category, description, and the like, of a multimedia asset data

file 108. The schedule allows the VOD server 125 to locate the elements of a multimedia asset data file 108 by providing locator URLs. The locator URLs may include a metadata URL that points to a location on the VOD management system 110 and an

5   asset URL that points to a local FTP server or catcher 124, for example. Because the schedule is configurable for each MSO 112 and each deployment, the present invention is capable of coordinating the prioritization and scheduling of the delivery of multimedia asset data files 108 to each individual MSO 112

10   or each individual MSO 112 deployment. Furthermore, the customized schedules are usable with the previously discussed custom EPG function to further customize the EPGs used by each MSO 112 or deployment.

[0048]   Multimedia asset data files 108 may be stored by

15   the VOD management system 110 in either internal content locations (*e.g.*, multimedia asset management ("MAM") systems that include large third party deep archive repositories) or external content locations (*e.g.*, catchers 124 maintained by MSOs 112). That is, the files 108 themselves can be physically

20   located in any storage device or location, as long as the VOD management system 110 is able to track that location, such as, *e.g.*, tracking the physical location of the file by reference to an asset locator URL (or asset URL) for that physical

location. The following discussion focuses on files 108 stored

at external content locations, *e.g.*, at catchers 124 maintained

by MSOs 112. Here, to upload and process a multimedia asset

data file 108, the VOD server 125 must retrieve the various

5   elements of the multimedia asset data file 108 from a catcher

124 (step 506). The master schedule allows the VOD server 125

to locate the elements of the multimedia asset data files 108

(ex. feature, preview, graphic, metadata) that have been

transmitted to the catcher 124 by providing metadata URLs for

10   each multimedia asset data file 108. The URL used to retrieve

the elements of the multimedia asset data file 108 will vary

depending on the caller location, access protocol, and

security. The specific machine that is accessed to obtain an

element will depend on a caller location. The specific machine

15   accessed by the VOD server 125 will generally be the catcher

124, but may be an archive repository for internal content.

The URL further indicates the appropriate protocol used to

retrieve a element from a particular machine (*e.g.*, file://,

http://, ftp://, https://, and the like). Also, the URL

20   provides a user or caller with information necessary to

authenticate with a content host.

[0049]   The VOD server 125 submits the metadata URL,

which may contain a server ID and an asset ID, for a particular

multimedia asset data file 108 to the VOD management system

110, and the VOD management system 110 in turn provides asset

URLs, with data regarding the physical location of files, to

the VOD server 125 (step 508). In one embodiment, the VOD

5   management system 110 may generate responsive metadata on-the-

fly, thereby allowing for metadata localization and permitting

vendor-specific adjustments. After receiving the asset URLs

from the VOD management system 110, the VOD server 125 analyzes

the asset URLs to determine whether the data was properly

10   received (step 510). If the VOD server 125 determines that the

asset URLs were not properly received, the VOD server 125

transmits an alarm to the VOD management system 110 to request

a retransmission of the asset URLs (step 512). If the asset

URLs are properly received, the VOD server 125 then loads the

15   metadata (step 514). The VOD server 125 determines whether the

metadata was properly loaded (step 516), and in the event of a

failure to properly load the metadata the VOD server 125

transmits an alarm signal to the VOD management system 110

(step 518), thereby informing the system that follow-up and

20   diagnosis is required.

[0050]   The asset URLs are used by the VOD server 125 to

retrieve the elements of the multimedia asset data file 108

that have been transmitted to the catcher 124. In the

illustrated example in which movie/feature, preview, and

graphics elements were transmitted to the catcher 124, using

the asset URLs received from the VOD management system 110, the

VOD server 125 initiates a series of file transfers, which may

5   be FTP transfers for example, from the catcher 124 in order to

load the elements of the multimedia asset data file 108.

[0051]   For the movie/feature element, the VOD server

125 submits the asset URL corresponding to the movie/feature

element to the catcher 124, and the catcher 124 responds by

10   transmitting the movie/feature element to the VOD server 125

(step 520). After receiving the movie/feature element from the

catcher 124, the VOD server 125 analyzes the movie/feature

element to verify that the element was properly received (step

522). If the movie/feature element was not properly received,

15   the VOD server 125 transmits an alarm to the VOD management

system 110 and/or the catcher 124 (step 524). If the

movie/feature element is properly received, the VOD server 125

begins to load the element (step 526). The VOD server 125

determines whether the movie/feature element was properly

20   loaded (step 528). In the event of a failure to properly load

the movie/feature element, the VOD server 125 transmits an

alarm signal to the VOD management system 110 (step 530),

thereby informing the system 110 that follow-up and diagnosis is required.

[0052] The VOD server 125 retrieves the preview element of the multimedia asset data file 108 in a similar manner. For example, the VOD server 125 submits the asset URL corresponding to the preview element to the catcher 124, and in response the catcher 124 transmits the preview element back to the VOD server 125 (step 532). After receiving the preview element from the catcher 124, the VOD server 125 analyzes the element to determine whether the preview element was properly received (step 534). If the preview element was not properly received, the VOD server 125 transmits an alarm to the VOD management system 110 (step 536). Otherwise, the VOD server 125 begins to load the preview element (step 538). The VOD server 125 determines whether the preview element was properly loaded (step 540). In the event of a failure to properly load the preview element, the VOD server 125 transmits an alarm signal to the VOD management system 110 (step 542), thereby informing the system 110 that follow-up and diagnosis is required.

[0053] In the example workflow, the VOD server 125 also retrieves a graphic element of the multimedia asset data file 108. As with the movie/feature and preview elements, the VOD server 125 submits the asset URL corresponding to the graphic

element to the catcher 124, and in response the catcher 124

transmits the graphic element back to the VOD server 125 (step

544). After receiving the graphic element from the catcher

124, the VOD server 125 determines whether the element was

5   properly received (step 546). If the graphic element was not

properly received, the VOD server 125 transmits an alarm to the

VOD management system 110 (step 548). If the graphic element

was properly received, the VOD server 125 begins to load the

element (step 550). Next, the VOD server 125 determines

10   whether the graphic element was properly loaded (step 552). In

the event of a failure to properly load the graphic element,

the VOD server 125 transmits an alarm signal to the VOD

management system 110 (step 554), thereby informing the system

110 that follow-up and diagnosis is required.

15   [0054]   The upload process terminates when the VOD

server 125 confirms the success or failure of a particular

attempt to load all of the elements of the multimedia asset

data file 108 (step 556), and the file 108 is completely loaded

on the VOD server 125 (step 558). In order to improve

20   visibility of the upload process, additional status updates may

occur earlier in the upload process, for example, upon

completion of the FTP transfer of one of the elements of the

multimedia asset data file 108. Additionally, the VOD server

125 preferably continuously updates the status of the

multimedia asset data file 108 with the VOD management system

110 throughout the upload process.

[0055]   By verifying the proper reception and loading of

5   the elements of the multimedia asset data file 108 throughout

the upload process (ex. steps 510, 516, 522, 528, 534, 540,

546, 552), the system 110 provides real-time or near real-time

verification of content delivery failures, as well as

visibility into the VOD server 125 upload operations as they

10   pertain to the content delivery process.

[0056]   The methods of the present invention are also

used to aggregate usage information from each VOD deployment,

and thereby provide visibility into the use of the multimedia

asset data files 108. At regular intervals, the VOD server 125

15   provides the VOD management system 110 with data on the

features that are requested by the users of the MSO 112. Using

this data, the VOD management system 110 prepares a usage

report. To prepare the usage report, the VOD management system

110 creates a master reporting database that includes usage

20   information from across the MSO's 112 network. In one

embodiment, the usage report is provided to the MSO 112 and the

content providers 102 in the form of stock reports.

Preferably, the MSO 112 has access to the entirety of the usage

report, whereas the content providers 102 have restricted

access to the usage report. Here, the MSO 112 provides the VOD

management system 110 with business rules to determine the

extent to which any content provider 102 has access to the

5   usage report. Additionally, the VOD management system 110 is

capable of exporting the usage report, or the underlying data,

to other systems in order enable the MSO 112 to conduct a more

advanced analysis of the usage patterns of the features

delivered by the VOD servers 125 to its users. The information

10   and data contained in the usage report may include a listing of

the multimedia content that has been licensed, the content that

is available for distribution to the users, the estimated time

a particular multimedia asset data file 108 will be delivered

to the MSO 112, the time at which a multimedia asset data file

15   108 was loaded on to a VOD server 125 of the MSO 112, the

amount of storage on the VOD servers 125 that is allocated to

any particular content provider 102, the revenue generated by

any specific feature, and the like. Usage reports are capable

of being searched and sorted using multiple criteria,

20   including, *e.g.*, content provider, studio, genre, region, and

the like. Furthermore, in one embodiment, the VOD management

system 110 incorporates preference engines that aid content

providers 102 and MSOs 112 target promotions and advertisings

to certain users based upon the usage report. Additionally,

the VOD management system 110 is capable of supplementing the metadata of each multimedia asset data file 108 with data contained in the usage reports. For example, the metadata of a given multimedia asset data file 108 may be

5   supplemented/augmented with detailed performance/usage information for that multimedia asset data file 108 that a content provider 102 or MSO 112 may later user for campaign management. For example, after analyzing the usage information for a multimedia asset data file 108, a content provider 102

10   may elect to bundle that file 108 with other files 108, initiate promotional pricing for that file 108, and the like.

[0057]   To facilitate communication between the VOD management system 110 and applications used by the MSOs 112 and content providers 102, the VOD management system 110 will

15   preferably implement a light weight web services API. The VOD management system 110 web service API is preferably implemented via XML over HTTP/HTTPS with requests initiated via HTTP "GET" and "POST" commands. Requests sent to the web services API may be initiated via a HTTP query string, with the web services API

20   returning responses as XML documents. API query strings preferably consist of a protocol (HTTP or HTTPS), a VOD management system 110 host and port, a root path (/mms/), a method name, and a query string. Access to the VOD management

system 110 web service API is handled via HTTP basic

authentication. Remote applications preferably access the VOD

management system 110 as a specific user. The VOD management

system 110 will respond to the API call or refuse the

5 connection depending on the VOD management system 110 roles

(level of authorization) associated with the user/remote

application.

[0058] Preferably, the web services API will be capable

of performing the following functions. The web services API

10 will allow for an asset initialization call that enables a

content provider 102 to register a multimedia asset data file

108 with the VOD management system 110. A pitcher confirmation

call may be used by a pitcher 122 to signal to the VOD

management system 110 that a multimedia asset data file 108 has

15 been successfully pitched. A catcher confirmation call may be

used by a catcher 124 to signal to the VOD management system

110 that a multimedia asset data file 108 has been successfully

caught. Additionally, in the event of a catch or validation

failure, the catcher 124 may use the catcher confirmation call

20 to transmit an error message to the VOD management system 110.

A schedule request call may be used by the VOD server 125 to

request a schedule from the VOD management system 110. A

metadata request call may be used by the VOD server 125 to

request localized package metadata from the VOD management

system 110. A package confirmation call may be used by the VOD

server 125 during the upload process in order to communicate,

to the VOD management system 110, status changes associated

5   with the multimedia asset data file 108 during the upload. The

VOD server 125 may also use a reporting call to deliver usage

reporting statistics, to the VOD management system 110,

relating to the delivery of multimedia asset data files 108 to

end users of the MSO 112. In a preferred embodiment, the web

10   services API returns an XML document in response to any of the

aforementioned calls, if a response is necessary. The response

may also include standard HTTP status or error codes.

[0059]   Turning to Figure 6, the physical components

required to implement the systems and methods of the present

15   invention are illustrated. The VOD management system 110

preferably includes a VOD management point of presence ("POP")

130 and a VOD management network operations center ("NOC") 132.

The VOD management POP 130 is preferably a high availability

data center with redundant power and cooling systems. The

20   supporting infrastructure for the VOD management POP 130 will

also include redundant application and database servers, server

backup systems, high availability switching gear, and a

dedicated firewall. The VOD management NOC 132 is utilized to

monitor the VOD management system 110. The infrastructure to

support and implement the VOD management NOC 132 is housed in a

location in close proximity to (or in the same location as) the

VOD management POP 130. To monitor the VOD management POP 130,

5   the VOD management NOC 132 may use a simple network management

protocol ("SNMP") management system. The MSO 112 has access to

the VOD management system 110, preferably using an internet

connection, in order to monitor the status of content being

delivered to the catchers 124 of the MSO 112. The content

10   providers 102 also preferably communicate with the VOD

management system 110 via an internet connection.

Additionally, the content providers 102 preferably utilize a

satellite-based system 134 to deliver multimedia asset data

files 108 to MSOs 112.

15   [0060]   Each MSO 112 preferably implements a catcher 124

to receive multimedia asset data files 108. The catcher 124

then uploads the files 108 to a VOD server 125 as described

herein. Using a suitable network, such as, e.g., a RF network

136, the VOD server 125 then delivers the feature element or

20   preview element obtained from the catcher 124 to end users,

upon request by the end users, by delivering those elements to

set top boxes 138.

[0061]   Figure 7 illustrates the implementation layers of one embodiment of the VOD management system 110. The top level of boxes in Figure 7 are example application clients with which the VOD management system 110 may communicate. A web client 702 enables a user to communicate with the VOD management system 110 with a standard internet/web browser. A java message service ("JMS") client 704 enables a user to communicate with the VOD management system 110 using a JMS API. The JMS client 704 preferably utilizes established messaging formats, queues, and topics to initiate asynchronous calls between the client 704 and the VOD management system 110. An enterprise java beans ("EJB") client 706 utilizes J2EE enterprise java beans to initiate synchronous calls with the VOD management system 110. The EJB client 706 preferably utilizes established EJB home interfaces to construct objects, and uses session and entity bean interfaces to conduct synchronous calls.

[0062]   The VOD management system 110 incorporates several external interfaces to facilitate communication between the application clients and the VOD management system 110. The following are several external interfaces suitable for incorporation into the VOD management system 110. A web foundations interface 708 generates the user experience and

state needed to support a web client 702. The web foundation

interface 708 may include java server pages ("JSPs"), servlets,

wireless application framework ("WAF") components, and GUI

beans. The web foundation interface 708 is preferably hosted

5   by a J2EE application server's web container. A JMS API 710 is

designed to receive and process JMS messages from a JMS client

704 and from remote messaging clients. The JMS API 710 is

implemented using EJB message driven beans. The JMS API 710 is

preferably also implemented as wrappers around lower-level

10   application engines. An EJB API 712 provides EJB wrappers

around low-level application functionality. The EJB API 712

provides a simple API that may be shared with developers, and

may be implemented as stateless session EJBs. A web services

API 714 provides a light weight synchronous API for interacting

15   with the VOD management system 110, and is configured to

interface with a web client 702. The web services API 714

preferably utilizes XML over HTTP or simple object access

protocol ("SOAP") to access high level application

functionality. In one implementation, the clients 702, 704,

20   and 706 interact directly with the aforementioned external

interfaces. Alternatively, the clients 702, 704, and 706

interact with the external interfaces using a set of helpers

called service adaptors 716. Service adaptors 716 simplify

communication with the clients 702, 704, and 706 by

encapsulating any complexity associated with web, JMS, and EJB

services, respectively.

[0063]   The next layers of Figure 7 represent internal

system components of the VOD management system 110. These

5   components are capable of running within a single process,

although multiple instances may exist simultaneously within

different processes. These components provide application

interfaces for the internal operations and database schemes

employed by the VOD management system 110. A component

10   programmatic API 718 incorporates a set of java interfaces that

address the VOD management system's 110 major functional

components. The functions addressed by the component

programmatic API 718 include managing workflow, maintaining

database persistence, managing packaging of multimedia asset

15   data files 108, localization of those files 108, and scheduling

of the deployment of the files 108. A set of engine

implementations incorporate the bulk of the VOD management

system's 110 programming code, and implements interfaces used

by the system 110. The engine implementations include a

20   business objects engine 720, a workflow engine 722, a packaging

engine 724, a platform converter engine 726, a localization

engine 728, and a scheduling engine 730. These engines provide

flexible and extensible functionality that may be customized to

address the needs of specific MSOs 112 and content providers
102.

[0064]   The VOD management system 110 also makes use of

5   both a metadata relational database 732 to store data.
Information is preferably stored in the form of XML documents
based on XML templates 734.

[0065]   The methods and systems of the present
invention, although described with respect to VOD content
delivery to MSOs 112, are also usable in other environments.

10   For example, the methods and systems of the present invention
may be used by a telephone company or a content delivery
network. Because the methods and systems of the present
invention are designed to support a continuum of platform
delivery options, the methods and systems of the present

15   invention may be used to support broadband delivery,
interactive television content delivery, streaming content,
cable video-on-demand, cable subscription video-on-demand, head
end origination, and downloading of content.

[0066]   With specific regard to the delivery of

20   broadband content and the use of PC-centric headends by MSOs
112, the methods and systems of the present invention provide a
mechanism for pre-caching broadband content by coordinating the
delivery and propagation of assets regardless of origin or

destination. Broadband content that may be pre-cached by the

present invention include IP video, non-video IP, web or

internet content, and interactive television content and

related applications.

5   [0067]   Though the invention has been described with

respect to specific preferred embodiments, many variations and

modifications will become apparent to those skilled in the art.

It is therefore the intention and expectation that the appended

claims be interpreted as broadly as possible in view of the

10   prior art in order to include all such variations and

modifications.